

RECEIVED
CENTRAL FAX CENTER
OCT 13 2009

AMENDMENTS TO THE CLAIMS:

What is claimed is:

1. (Currently Amended) A process for making a gradient material, comprising:
employing a screw extruder system comprising material rate input conditions; and
operating conditions; and in conjunction with a given hardware element configurations;
wherein the screw extruder system comprises a twin-screw extruder with
segmented elements to influence a specific architecture of the gradient material;
employing multiple feed streams of raw ingredients at variable, feed rates for
compounding and extruding into a final material in the twin-screw extruder;
predicting a gradient architecture of the gradient material by utilizing one of time and
volume residence distribution functions with a functional description of the disturbances;
introducing disturbances into at least one of the multiple feed streams by altering at least
one of the material rate input conditions and the operating conditions, in conjunction with a
predetermined hardware element configuration of the given hardware element configurations,
wherein said introducing disturbances comprises said raw ingredients are
extruded while a first set of operation parameters are selected that lead up to steady state
conditions, which run at a hold time, upon which the process is disturbed to a second set of
operation parameters for a specific period of time before a return to said first set of operation
parameters, which results in the final material, and
wherein the disturbances are selected from at least one of the group of step
disturbances, linear ramp disturbances, and non-linear ramp disturbances to form a
compositional gradient as part of the final material; and

10/807,582

producing a the final material comprising a the compositional gradient in an architecture of the final material,

wherein said final material is a the gradient material ~~formed by segmented elements of the screw extruder system, and~~

wherein the final material comprises a structure of at least two homogeneous materials separated by a continuous compositional gradient and

~~wherein the disturbances are selected from at least one of the group of step disturbances, linear ramp disturbances, and non-linear ramp disturbances to form the compositional gradient.~~

2. (Original) The process of claim 1, wherein the screw extruder system comprises a twin screw extruder system.

3. (Canceled)

4. (Previously Presented) The process of claim 1, wherein said at least one of the material rate input conditions is disturbed.

5. (Previously Presented) The process of claim 1, wherein said at least one of the material rate input conditions comprises at least one ingredient feeding rate.

6. (Previously Presented) The process of claim 1, wherein said at least one of said operating conditions is disturbed.

10/807,582

7. (Previously Presented) The process of claim 1, wherein said at least one of said operating conditions is selected from the group of a screw speed, system temperature, system pressure, or a combination thereof.

8. (Previously Presented) The process of claim 7, wherein said at least one operating condition comprises the screw speed.

9. (Previously Presented) The process of claim 2, wherein the hardware element configurations are selected from at least one of the group of a screw geometry, die geometry, and ingredient feeding locations.

10. (Canceled)